MP Finding1

Finding: ARB collects environmental data for EPA decision-making and/or funded by EPA outside of the ARB and EPA quality assurance programs.

Discussion: The ARB has no centralized Quality Management of environmental data collection activities related to EPA grants and data used to support EPA decision-making. This is contrary to what is reflected in the ARB QA Manual. The MLD QA Management Branch Chief is unaware of the details of projects that do not originated in the MLD, does not believe that MLD has any QA responsibility for projects originated by other ARB Divisions, and is disinclined to apply EPA quality assurance standards to data collected by MLD which is not directly required of MLD by EPA air monitoring regulation.

One specific project with EPA funding, which the MLD QA Branch has not exercised QA authority over, is the ongoing Lake Tahoe studies. Another project, which the QA Branch is involved with but the Branch Chief claimed was not relevant to EPA's oversight, is the Lodi diesel emissions study. From an evaluation of ARB's 2007 grant work plan it is evident that the Lodi study supports several activities specifically called out under the grant.

All organizations conducting environmental programs funded by EPA are required to establish and implement a quality management system. In accordance with 40 CFR Part 31 and 35, grant recipients are required to document their quality system in a Quality Management Plan through EPA Order 5360.1 A2, Policy and Program Requirements for the Mandatory Agency-wide Quality System (EPA 2000).

Where data is not funded by EPA but is used for EPA decisions (including SIPs and CAA rulemaking) the data must either directly meet the requirements for EPA funded projects in 5360.1 or be acceptable as secondary data by demonstrating validity through quality assurance and/or scientific peer review. This is dictated by requirement 8 of EPA Order 5360.1:

> *(8) Assessment of existing data, when used to support Agency decisions or other secondary purposes, to verify that they are of sufficient quantity and adequate quality for their intended use.*

Where data collection efforts do not include sufficient quality controls to be assessed or peer reviewed the data should not be used to support EPA decisions.

MP Finding 9:

Finding: Positions that are vacant for over 6 months are routinely eliminated.

Discussion: This process has put a strain on some MLD sections. MLD should develop mechanisms to ensure that essential quality assurance and monitoring support operations are performed in the eventuality of mandated staff reductions.

Finding MP14:

Finding: Mass determination of PM10 filters should include blank controls.

Discussion: Blank controls help to evaluate the impacts of filter handling and storage in the laboratory and the field. They are required in regulation as a mechanism for evaluating filter media, see 40 CFR Part 50, Appendix J, Section 7.2.3. Additionally, EPA Compendium Method IO-3.1 notes in Section 5.4, "Provide one blank sample with ever 10 actual samples."

Recommendation: Include mass analysis of PM10 blanks in the lab SOPs

Finding MP15:

Finding: Temperature and humidity measurements in the weigh rooms are only logged on a paper chart and are not formally analyzed to determine compliance with regulatory criteria.

Discussion: According to a review of the logs and interviews with weigh room staff, the temperature and humidity in MLD's two weigh rooms is stable. However there are times when temperature and humidity spikes and/or excursions occur. Currently the technicians "eyeball" the charts to determine compliance with regulatory requirements. If MLD was to calculate the actual conditions with the aid of a software program and electronic data logging software, there would be no question as to when weigh room conditions were suitable.

Recommendation: ARB should more accurately track the temperature and humidity conditions in its weigh rooms.

FindingMP16:

Finding: The PM10 laboratory only recently started a logbook to track verification of "working" mass standards.

Discussion: The PM10 "working" mass standards are used with every batch of filters to verify balance performance. Their weight is periodically verified by a comparison check to "primary" mass standards. For the data tracked from 2006 no documentation of this verification was available. However, there was a logbook recently begun to rectify this deficiency. It is recommended that this logbook be continued and that it contain additional documentation (such as mass standard identifiers), similar to what is provide for the PM2.5 "working" standard verification logbook.

Recommendation: ARB should continue documenting the verification of PM10 "working" mass standards.

Finding MP17:

Finding: Several additional improvements could be made to the PM2.5 weighing process.

Discussion: The following were noted:

- The PM2.5 filter identification numbers (embossed on each filter) are not recorded. Using the numbers on the filters is a mechanism to prevent and identify the mixing up of filters. Because the MLD PM2.5 weigh room procedure is extremely organized the auditor did not find this to be a significant concern.
- The start date and time for the beginning of pre-weight conditioning of PM2.5 filters was not documented. Because filters are conditioned well in excess of 24 hours and the PM2.5 laboratory is well organized this was not considered significant.
- The laboratory staff was not aware of new regulatory requirement for PM2.5 monitoring. Of particular note is the new temperature requirement from 40 CFR Part 50, Appendix L, included below:
    - *8.3.6 The post-sampling conditioning and weighing shall be completed within 240 hours (10 days) after the end of the sample period, unless the filter sample is maintained at temperatures below the average ambient temperature during sampling (or 4 °C or below for average sampling temperatures less than 4 °C) during the time between retrieval from the sampler and the start of the conditioning, in which case the period shall not exceed 30 days. Reference 2 in section 13.0 of this appendix has additional guidance on transport of cooled filters.*

Recommendation: Consider the improvements noted in the discussion in future revisions of the PM lab SOPs. Ensure that laboratory staff are aware of the new filter temperature requirements.

Finding MP18:

Finding: The PM10 and PM2.5 documentation and archived filters were well organized and easily tracked.

Discussion: EPA Region 9 performs a data tracking exercise as part of our technical system audits to simulate what might happen if our designation decisions are in question and/or challenged and data documentation needs to be verified. The MDL laboratory staff did an excellent job locating the data request by the auditor.

Finding MP19:

Finding: The MLD weigh sessions have been automated in a manner that reduces the possibility of operator error.

Discussion: EPA Region 9 was impressed with the automated weighing process and was pleased to note that the technicians were engaged in the development of this system.

Finding MP 20

Finding: ARB MLD does not calibrate monitoring equipment at PQO sites.

Discussion: Over the past decade the ARB MLD monitoring sections have reduced calibration support for District sites. Consequently, Districts have established their own instrument calibration procedures independent of the ARB PQO. This practice does not support the existence of a centralized standardization of instrumentation and consequently consistent data quality throughout the PQO.

Finding MP 27

Finding: The Special Purpose Monitoring Section conducts some monitoring which EPA should be made aware of.

Discussion: The Special Purpose Monitoring Section conducts monitoring as a "contractor" of ARB or other agency (i.e., DPR) researchers. Some of this monitoring may be funded wholly or partially by EPA (through ARB or other State Agencies) and other monitoring could have implication for NAAQS determinations or network design. Therefore where possible and appropriate an EPA monitoring contact should be informed of monitoring that is taking place.

MRK Finding MLD2

Finding: CARB should continue to implement its air monitoring training program.

Discussion: CARB is developing a training program for ambient air monitoring. This includes four modules:

1. fundamental of air monitoring
2. station operations
3. calibration principles
4. individual instrument training

These courses are open to anybody, including other air districts. Many of the modules are still in the development phase.

Another aspect of training offered by CARB occurs when CARB installs an instrument at a non-CARB site. In these cases, the CARB installer should train the local district on how to operate the instrument. We heard from districts that this does not always happen.

Recommendation: We commend CARB for developing a training program that is open to all agencies. We recommend that CARB continue these efforts and make districts within the CARB PQAO aware of the courses. We also recommend that CARB ensure that all districts are properly trained upon the installation on instruments by CARB.

MRK Finding MLD3

Finding: MLD does not consider monitoring by non-CARB agencies to be their responsibility.

Discussion: The Chief of the Air Quality Surveillance Branch stated that he does not consider it his responsibility to provide support to districts unless they ask. The goal of his branch is to get high quality data from his branch.

40 CFR notes:

> *3.1 Primary Quality Assurance Organization. A primary quality assurance organization is defined as a monitoring organization or a coordinated aggregation of such organizations that is responsible for a set of stations that monitors the same pollutant and for which data quality assessments can logically be pooled. Each criteria pollutant sampler/monitor at a monitoring station in the SLAMS network must be associated with one, and only one, primary quality assurance organization.*
> *3.1.1 Each primary quality assurance organization shall be defined such that measurement uncertainty among all stations in the organization can be expected to be reasonably homogeneous, as a result of common factors. Common factors that should be considered by monitoring organizations in defining primary quality assurance organizations include:*
> *(a) Operation by a common team of field operators according to a common set of procedures;*
> *(b) Use of a common QAPP or standard operating procedures;*
> *(c) Common calibration facilities and standards;*
> *(d) Oversight by a common quality assurance organization; and*
> *(e) Support by a common management, laboratory or headquarters.*
> *3.1.2 Primary quality assurance organizations are not necessarily related to the organization reporting data to the AQS. Monitoring organizations having difficulty in defining the primary quality assurance organizations or in assigning specific sites to primary quality assurance organizations should consult with the appropriate EPA Regional Office. All definitions of primary quality assurance organizations shall be subject to final approval by the appropriate EPA Regional Office during scheduled network reviews or systems audits.*

MLD's role in meeting CARB's PQAO responsibilities includes ensuring that a common set of procedures (a), and common SOPs (b) are followed by all entities within the CARB PQAO.

Recommendation: MLD should work with districts within the CARB PQAO to make sure they all follow a common set of procedures and common SOPs.

Finding MRK F6

Finding: Communication between the ARB PM mass analysis laboratory and local districts needs to be improved.

Discussion: Districts were concerned about the lack of feedback from ARB on the outcome of PM filters sent to the ARB laboratory for mass analysis. After sampling, District staff complete the chain of custody sheets and the PM filters are sent to ARB. From that point on ARB handles all data review. Districts complained that in the event of a problem with a particular sample day, ARB does not report back to them for many months. The result is the District has no opportunity for running a make-up sample or is not informed of problems requiring corrective actions, which could result in more lost or invalidated data.

Recommendation: ARB should develop a procedure that provides prompt feedback to Districts in the event of problems that could cause a loss of PM data.

Finding MP 22:

Finding: White out was noted on an MLD air monitoring form.

Discussion: It was noted that white out was used on a form produced by the MLD monitoring group. Changes to official records should not be covered or obliterated. Generally, mistakes should be indicated by a single line crossed out and with an initial and date.

Finding MP 20:

Finding: ARB MLD does not calibrate monitoring equipment at PQO sites.

Discussion: Over the past decade the ARB MLD monitoring sections have reduced calibration support for District sites. Consequently, Districts have established their own instrument calibration procedures independent of the ARB PQO. This practice does not support the existence of a centralized standardization of instrumentation and consequently consistent data quality throughout the PQO.

Recommendation: If ARB is to remain the PQAO it needs to ensure consistent operations throughout the local districts it oversees.

MP Finding 2:

Finding: Districts that are part of the ARB PQO collect data for EPA decision making and/or funded by EPA that is not quality assured by the ARB PQO.

Discussion: The Districts that are part of the ARB PQO collect monitoring data that is not related to the PQO's activities. This data could be for special projects initiated by individual Districts or for program dictated by EPA (Such as PAMS). Where this data could be used for EPA decision-making or is funded by EPA the Districts should have independent quality systems and supporting quality assurance plans. This is not always the case. It should be made transparent to EPA and ARB by the District which monitoring is intended to be included under the ARB PQO. Where monitoring is not clearly part of the ARB PQO responsibilities the Districts must maintain an appropriate quality assurance system. In the case of EPA funded work this requires the District to act as a PQO for the work in question and submit appropriate QAPPs.

All organizations conducting environmental programs funded by EPA are required to establish and implement a quality management system. In accordance with 40 CFR Part 31 and 35, grant recipients are required to document their quality system in a Quality Management Plan through EPA Order 5360.1 A2, Policy and Program Requirements for the Mandatory Agency-wide Quality System (EPA 2000).

Where data is not funded by EPA but is used for EPA decisions (including SIPs and CAA rulemaking) the data must either directly meet the requirements for EPA funded projects in 5360.1 or be acceptable as secondary data by demonstrating validity through quality assurance and/or scientific peer review. This dictated by requirement 8 of EPA Order 5360.1:

> *(8) Assessment of existing data, when used to support Agency decisions or other secondary purposes, to verify that they are of sufficient quantity and adequate quality for their intended use.*

Where data collection efforts do not include sufficient quality controls to be assessed or peer reviewed the data should not be used to support EPA decisions.

MP Finding 3:

Finding: The ARB Primary Quality Assurance Organization does not meet the requirements in 40 CFR Part 58, Appendix A, Section 3.1 for its dependent Districts.

Discussion: The ARB Primary Quality Assurance Organization (formerly called "Reporting Organization") does not have sufficient controls to ensure that local Districts

follow consistent procedures and produce data of similar quality. It appears that these "controls" have eroded over time as Districts have become more independent in the data collection activities and as MLD's budget and staffing levels have been insufficient to support many District activities (such as calibration, standardization, training, data validation, and data reporting). 40 CFR notes:

> ***3.1*** *Primary Quality Assurance Organization. A primary quality assurance organization is defined as a monitoring organization or a coordinated aggregation of such organizations that is responsible for a set of stations that monitors the same pollutant and for which data quality assessments can logically be pooled. Each criteria pollutant sampler/monitor at a monitoring station in the SLAMS network must be associated with one, and only one, primary quality assurance organization.*
>
> > ***3.1.1*** *Each primary quality assurance organization shall be defined such that measurement uncertainty among all stations in the organization can be expected to be reasonably homogeneous, as a result of common factors. Common factors that should be considered by monitoring organizations in defining primary quality assurance organizations include:*
> >
> > > ***(a)*** *Operation by a common team of field operators according to a common set of procedures;*
> > > ***(b)*** *Use of a common QAPP or standard operating procedures;*
> > > ***(c)*** *Common calibration facilities and standards;*
> > > ***(d)*** *Oversight by a common quality assurance organization; and*
> > > ***(e)*** *Support by a common management, laboratory or headquarters.*
> >
> > ***3.1.2*** *Primary quality assurance organizations are not necessarily related to the organization reporting data to the AQS. Monitoring organizations having difficulty in defining the primary quality assurance organizations or in assigning specific sites to primary quality assurance organizations should consult with the appropriate EPA Regional Office. All definitions of primary quality assurance organizations shall be subject to final approval by the appropriate EPA Regional Office during scheduled network reviews or systems audits.*

- The ARB PQO does not have common field operators between ARB and local Districts. ARB does offer some training and meetings for field operators, however these are not extensive and most Districts do not participate.
- The ARB PQO has common procedures available. However, ARB has not developed procedures for some equipment employed by individual Districts; ARB does not consider itself obligated to inform Districts of procedural changes and problems (although sometimes they inform Districts of these); many District chose not to follow ARB procedures; and Districts do not get ARB approval

of their procedures as required in the QA Manual Section 1.0.2.3, which notes, "Unless alternative procedures are submitted in writing to, and approved in writing by the ARB Monitoring and Laboratory Division, the procedures set forth in the ARB Air Monitoring Quality Assurance Manual (Volumes I through VI, as developed) apply to all agencies within the ARB reporting organization."

- The ARB PQO has a "Standards Laboratory." However, this laboratory is not utilized by most Districts and utilization of the Standards Laboratory is not compulsory. Additionally, ARB does not track or control in any manner the types of standards used by the Districts.
- The ARB PQO does have common QA oversight in regards to instrument audits and criteria pollutant data evaluation. However, not all instruments are audited and non-criteria pollutant laboratories and projects operated or contracted by the Districts are not routinely overseen by ARB. Additionally, data validation and internal data corrective actions (not related to audits) are not performed consistently by the Districts and are not a part of the ARB QA system.
- The ARB PQO does not have a shared management, headquarters, or laboratory between ARB and the Districts, with the exception to some analytical laboratory analysis performed by the MLD laboratory for some Districts.

In addition to the CFR requirements discussed above other complicating factors are that some Districts receive separate monitoring grants from EPA and/or independently report data to AQS. Based on the discussion of the five PQO criteria, the ARB PQO does not meet the CFR requirements. Meeting these requirements for some Districts may be easy to achieve (e.g., Sacramento Metro AQMD), however others operate with a significant level of independence (e.g. Great Basin AQMD).

MP Finding 8

Finding: There is no central organization that ensures Districts are aware of and follow changes to the QA Manual and related SOPs.

Discussion: The ARB MLD branches use the agency website to update documents incorporating operational changes. These changes are not normally communicated to the Districts in the ARB PQO. To ensure the PQO is functioning consistently it should notify all District monitoring staff of changes and, where needed, provide guidance and training on implementing changes, and verify that changes have been implemented or that the procedures used are otherwise equivalent.

MRK Finding F2

Finding: Audits of NSAQMD instruments performed by CARB do not conform to CFR requirements.

Discussion: Flow audits for PM instruments should occur every 6 months but the schedule has been closer to once/year. For example, the two most recent CARB flow checks Joe had listed were 8/8/2006 and 6/4/2007. Ozone audits happen about once/year – the last two audits Joe had listed were 6/26/2006 and 6/4/2007. Joe said that CARB is not doing through-the-probe audits – they hook up their line straight to the back of the ozone instrument.

Recommendation: CARB flow checks should be scheduled for every 6 months for PM instruments. The ozone audit should be done through-the-probe.

MRK Finding F5

Finding: There is not a central, independent, dedicated quality assurance manager/officer responsible for communicating and ensuring that quality assurance activities are carried out in field operations and information management.

Discussion: 40 CFR, Part 58, Appendix A, Section 2.2, requires that each ambient air monitoring organization have an independent quality assurance function. While CARB performs some functions, such as the annual certification of the ozone standard, and flow audits, there are many QA functions not being performed. These include:

- Periodic audits of the quality management system (management system reviews), routine procedures, and data quality to identify areas of improvement and to ensure that monitoring programs continue to consistently follow sound and documented procedures.
- The routine review and tracking of precision and accuracy data.

For example, automated instrument outputs are sent to the BAM at each station and then telemetered to HQ. Joe Fish reviews the ozone data and then submits these data directly to AQS – there is no additional QA check.

In addition, the definition of PQAO states that, "*Common factors that should be considered by monitoring organizations in defining primary quality assurance organizations include:*

(d) Oversight by a common quality assurance organization;"

Therefore, part of CARB's duties as PQAO for NSAQMD is to provide QA oversight.

We did find evidence of CARB reviewing NSAQMD data on an ad hoc basis. Joe Fish provided some recent examples of his interactions with CARB.

- Email dated 5/23/2007 from Bob Weller (CARB) to Joe Fish (NSAQMD)
    - "Hi Joe, could you please check your ozone monitor at Quincy. In May 2007, the readings in AQMIS were all zeros. Earlier in 2007 there were a lot of very low values (1-2 ppb), Thanks, Bob Weller"
- Email dated 6/21/2007 from Jeff Austin (CARB) to Joe Fish (NSAQMD)

    - Hi Joe – FYI, when I was looking through some data we downloaded, I noticed the year is set to 2027 on the Truckee BAM1020. -- Jeff"
- Email dated 6/25/2007 from Bob Weller (CARB) to Joe Fish (NSAQMD)
    - "Hi Joe, the PM10 BAM data at Truckee has been problematic since June 6, 2007. Since there is a fire near the area (within 50 miles), we would like to get good data from this site. Thanks, Bob Weller"

Recommendation: ??? CARB should provide QA oversight for all aspects of NSAQMD's ambient air monitoring program.

MP Finding 4

Finding: ARB needs to upgrade their QA Manual to meet QMP and QAPP requirements.

Discussion: The ARB Air Monitoring Quality Assurance Manual is regularly updated and posted on the ARB website for MDL and District staff to refer to. The QA Manual meets many of the EPA's requirements for Quality Management Plans (QMPs) and Quality Assurance Project Plans (QAPPs). However, some additional information and procedures need to be incorporated into this document. EPA also requests that ARB formally either divide this document into a QMP and QAPPs or provide a crosswalk of how and where the EPA QMP and QAPP requirements have been addressed in a preamble to the document.

The last QA planning documents approved by EPA were a PM2.5 QAPP and the ARB's Quality Assurance Manual in December 1998 and June 1993, respectively. In order to facilitate review ARB should formally contact EPA Region 9 any time significant changes are made to the QAM or its attachments so EPA can expeditiously perform reviews.

All organizations conducting environmental programs funded by EPA are required to establish and implement a quality management system. In accordance with 40 CFR Part 31 and 35, grant recipients are required to document their quality system in a Quality Management Plan through EPA Order 5360.1 A2, Policy and Program Requirements for the Mandatory Agency-wide Quality System (EPA 2000). Additionally, ambient air monitoring specific requirements are found in 40 CFR, Part 58, Appendix A, Section 2.1. Guidance on developing QMPs can be found in the EPA guidance document "EPA Requirements for Quality Management Plans", EPA/240/B-01/002, March 2001.

The US EPA also requires that organizations develop a QAPP for each type of ambient pollutant that is measured. The QAPP integrates all technical and quality aspects of a project, including planning, implementation, and assessment. The purpose of the QAPP is to document planning results for environmental data operations and to provide a project-specific "blueprint" for obtaining the type and quality of environmental data needed for a specific decision or use. The QAPP documents how quality assurance and

quality control are applied to an environmental data operation to assure the results obtained are of the type and quality needed and expected. Further guidance on developing QAPPs can be found in the guidance documents "EPA Requirements for Quality Assurance Project Plans," EPA/240/B-01/003, March 2001, and "Guidance for Quality Assurance Project Plans," EPA/240/R-02/009, December 2002.

MP Finding 5

Finding: The ARB PQO corrective action process is not being followed as stated in the QA Manual.

Discussion: The QA Manual Volume I defines the ARB's only formal data corrective action as an Air Quality Data Action (AQDA). The definition from Section 1.0.6.3 is:

> *An Air Quality Data Action (AQDA) is a request for an investigation of the validity of ambient air quality data for a certain period of time. Figure 1.0.6.3 depicts an AQDA request form. AQDA requests can be initiated by any person suspecting erroneous data and serves as a means for withholding questionable air quality data pending further investigation.*

However, AQDA corrective actions were not found to be used outside of the ARB MLD Quality Assurance Section's performance/site audit program. The MLD Air Quality Surveillance Branch has a formal corrective action process beyond the AQDA Process that results in monitoring bulletins being sent out. However, this process does not go through independent QA review. The extent formal corrective action is taken in the Districts was not determined. However, District corrective action does not routinely go to ARB MLD for review, and on the occasion when it does (for NAAQS determinations) the process used is not defined.

MP Finding 7

Finding: EPA commends ARB MLD for producing Quality Assessment Reports and recommends that the ARB PQO develop a mechanism to use these reports to make specific corrective actions or other quality improvements.

Discussion: The MLD Quality Assurance Section does an excellent job producing reports to assess the overall quality assurance effectiveness of each part of the ARB PQO. These reports, no doubt, have a positive impact on many of the Districts performance. However, in order to produce data of consistent quality the ARB PQO needs to have a mechanism for systematic evaluation of the practices that lead to both poor and good quality data in order to improve data quality and consistency.

Recommendation: Keep up the good work of preparing quality assessment reports. It is recommended that ARB develop a centralized mechanism to use this information for quality improvement and corrective action.

MRK Finding F8

Finding: CARB site survey report was not accurate. (NSAQMD)

Discussion: Inaccuracies with the CARB audit sheet for Grass Valley include:
- Missed a very obvious tree within 4 m of ozone inlet
- Ozone calibration listed as not current but then was not listed as an action item.
- BAM – the audit report doesn't specify whether the BAM is PM10 or PM2.5. The BAM at Grass Valley is measuring PM2.5 but the purpose listed in the audit sheet is SLAMS. The BAM is not a FEM approved method for PM2.5.

The logbook at Portola was listed as up to date. I was told there is no logbook.

Recommendation: CARB should review siting criteria and information on site survey report during audits.

MRK Finding F9

Finding: CARB QA group lacking technical experience. (NSAQMD)

Discussion: The CARB QA group used to have much better technical expertise. For example, at Truckee the auditor did the ozone audit in high wind and didn't realize it could affect the audit. Another example is that the QA group didn't know how to do both volumetric and mass flow PM10 audits.

Recommendations: The QA team needs better training and to stay longer.

Finding RS1

Finding: The QMB lacks authority in the organization to provide direction and recommendation to the data collection, production, verification programs it should be overseeing. This finding is made as it was not clear to QAS all the QA activities performed by the Branches.

Discussion: Although QMB is independent and centrally situated in ARB's organization chart, the Branches appear to self directed in the QA it will perform, independent of any recommendations QMB may have. Functionally, in addition to QMB, QA is performed in the Northern Laboratory Branch, Air Quality Surveillance Branch and its Operations Support Section.

QMB has attempted to perform QA oversight and there are some records of reviews (e.g., performance audits of the Northern and Southern Laboratory Branch, whole air interlaboratory comparison checks). No records in response to QAS reports were available and it was noted by QAS that report recipients only need to consider recommendations made by them, and there is no requirement that recipients respond in writing. This lack of QAS authority, and Branches acting independently of one another,

and not towards a comprehensive goal, does not lend to the development of an effective quality assurance program for the organization. 40 CFR Part 58, Appendix A, Section 2.2, requires that each ambient air monitoring organization have an independent quality assurance function that is responsible for the effective implementation of the ***overall*** quality assurance operations of the organization.

In an organization the size of ARB, quality management should be the primary function of a centralized office such as QMB as established by ARB. This is to ensure that all QA/QC related activities and concerns are addressed with staff and resolved in the Board and Districts. Reemphasizing the QMB's authority in the organization and Districts for recommending and ensuring the production of quality data needs will help to reestablish the QMB's central, independent, and authoritative role in the organization. An internal audit in addition to that conducted by EPA should also be conducted to capture any deficiencies that EPA may not have uncovered in its audit, so QMB can develop a comprehensive QA system that is not independently operated in the Branches, but lead by QMB. Based on this self assessment, training programs should be developed. Communication channels should also be evaluated to ensure efficient exchange of QA related information e.g., changes in EPA's monitoring regulations, and that matters raised are acted upon and responded to in a timely manner. The responsibility for ensuring that the QA activities performed in the Districts mirror that of ARB should also be addressed by the QMB.

Recommendation: Reemphasize the QMB's authority to reestablish its central role and responsibility for ensuring data quality in ARB and Districts. Its role should be to establish a unified, structured, comprehensive QA program in ARB that includes overseeing (approving) the QA/QC activities conducted in the field, information management, and laboratory operations.

Responsibilities should include the provision of effective training, technical assistance and guidance (for developing quality assurance project plans, standard operating procedures, etc.), data collection plan approvals, and the performance of self assessments and audits of Branches involved in data collection, production, or verification. It should also be available to provide guidance to Districts that report AIRS information to it.

Finding RS2

Finding: There is a problem with obtaining access to AQS accounts of Districts that are part of the ARB PQO but their own AQS Reporting Organizations (RO).

Discussion: Each RO must be consulted to obtain permission to input AQS data for the sites operated by the RO. There have been complications for the MLD QA Section and others involved in central PQO activities gaining access to input data into AQS for dependent ROs. This is not acceptable, for a PQO to function the central QA and Data managers need AQS access.

Recommendation: Over the short term ARB should work with the RO's in the ARB PQO to facilitate obtaining access. Over the long term the Region should ask OAQPS to develop procedures for PQO's with multiple RO that are consistent with data quality.

Finding RS3

Finding: The ARB data system and AQS may contain inconsistent data for criteria pollutant data within the ARB PQO.

Discussion: The ARB PQO should be using consistent data for making decisions. However, it was indicated that at times MLD has invalidated data on the ARB database when dependent RO's have refused to invalidate data on AQS. This should not occur within a PQO.

Finding RS4

Finding: The QAS does not assure that sites that fail performance audits are re-tested after a corrective action is implemented.

Discussion: The QAS will make an effort to re-test sites based on their field schedule. In practice sites that are far from the Sacramento office do not get retested because it is prohibitively labor and resource intensive. The QAS should establish criteria when retesting is needed based on the necessity of data and/or develop an alternative to sending the Trailer based system to retest sites.

Finding RS5

Finding: The QAS has experienced a high staff turnover in recent years, which has impacted the level of institutional knowledge in the section and impacted their ability to perform audits.

Discussion: The QAS has responsibility for performance and site audits across the ARB PQO. This is one of the few threads of consistency that the PQO has and, as such, is a critical operation. Additionally, instrument and site problems encountered during the audits sometimes require a detailed knowledge of air monitoring operation across a diverse range of equipment. This knowledge is needed to: correct problems encountered conducting audits; judging the site operator's abilities to correct deficiencies needed for re-testing sites; evaluating siting and instrument configuration issues; demonstrate to District personnel that audit failures are due to site problems rather than improper auditing. Additionally, some audits have been canceled due to insufficient trained staff.

Recommendation: ARB MLD needs to develop a plan to reduce turnover in QA audit staff and/or attract more senior staff to the QA Section.

Finding RS6

Finding: Training, while in place in the ARB MLD does not necessarily extend to all staff and the ARB PQO Districts.

Discussion: The QAS in the QAB and the AQSB (through the OSS) have implemented training programs, which are in place but still being refined. EPA applauds ARB MLD on these and encourages ARB MLD to continue these and other training programs in place. Rather than the two groups developing QA training separately, there should be a central training and evaluation program that represents the entire PQO to ensure that all monitoring staff receive adequate and consistent QA training.

Finding RS7

Finding: System audits performed by QAS and the Stationary Source Division are conducted by request or on an as needed basis. The content of these audits performed are also dissimilar to EPA's definition of system audits focusing on program elements (compliance, permitting, rule development, hot spots, emission inventory, ambient air programs) although the QAS audit checklist is inclusive of both program and QA elements. Both should be reviewed.

Discussion: The frequency for performing system audits are documented on www.arb.ca.gov/audits/schedule.pdf. However, upon review of ARB-MLD's Annual Data Quality Report and interview, system audits are performed by request or on an as needed basis.

Recommendation: Future system audits should be performed as identified on ARB-MLD's web site cited. The audits should be inclusive of both program and QA activities reviewed and conducted using ARB-MLD's Audit procedures contained in Volume V, Appendix AH3.0, System Audit Procedures for Ambient Air Monitoring Programs, August 2002.

Finding RS8

Finding: ARB MLD does not perform routine audits of data quality.

Discussion: EPA QA/R-5, EPA Requirement for Quality Assurance Project Plans, discusses assessments that should be elements of a quality management program these include, "surveillance, management systems reviews, readiness reviews, technical systems audits, performance evaluations, audits of data quality, and data quality assessments." Audits of data quality include periodic checks of a small portion of the data produced to ensure that the data set was collected as specified by regulation and in the QA planning documents, included all the appropriate supporting documentation, all supporting data calculations were correct, and the validation was properly performed.

Finding RS9: Internal audits are not conducted on ARB-MLD's and Districts data management, reduction and review process.

Discussion: Results of reviews for both ARB-MLD and District produced data are reported into AIRS. It is important that QAS develop procedures for conducting internal audits of ARB-MLD and Districts data reduction and review for several reasons: 1) to ensure the data reduction and review is satisfactory; 2) to ensure that the quality of data for both ARB-MLD and District data is verified, known when reporting into AQS; and 3) to ensure results reported into AQS can be used by those accessing the information.

Recommendation: Internal audits should be conducted as soon as practicable, and on a scheduled frequency. Longer term, SOPs should be developed for conducting internal audits of ARB-MLD's and Districts data management, reduction and review process.

Finding RS10

Finding: Monthly (day-to-day) checks for precision and accuracy of data being uploaded by the majority of Districts into AQI is not occurring by ARB-MLD.

Discussion: It is commendable that ARB-MLD produces annual reporting for precision (nightly zero and span for gases and flow rates for particulate matter) and accuracy reports combining ARB-MLD and District sites. The annual reporting, however, occurs ***after*** the data is reported into AIRS and pools the individual monitoring data sets (e.g., SO_2, NO_2, O_3, CO, PM) collected to determine precision and accuracy. The pooling and averaging data collected over a year may smooth out or mask any precision and accuracy (P&A) criteria failures specific to a site. To more timely identify P&A anomalies, day-by-day examination of District and ARB-MLD monthly reported data should occur.

It is noted that day-to-day P&A checks are being performed for some Districts that submit data to ARB-MLD for uploading into AQS by both the QAS and AQSB. These checks are performed by the respective offices at the request of Districts.

Recommendation: Day-to-day check routines should be developed for District produced data as ARB-MLD, representing the Districts, is the primary quality assurance organization. The "script" for performing these checks can be provided Districts for incorporation into their data review computer program to enable automating. This is to ensure the daily data reported into AIRS meet precision and accuracy criteria established at 40 CFR Part 58, Appendix A, Section 2.3, and that precision and accuracy reporting is performed consistently throughout the organizations that are represented by PQAO.

It is further recommended that standard operating procedures be developed for performing these precision and accuracy checks on a monthly basis. These SOPs should include a step to check results of the annual performance audits against daily precision and accuracy results of the station to ensure they agree, and the positions responsible for doing so. If they do not, procedures for qualifying data and reporting to QAS need to be developed.

Finding RS22 <u>(OPA)</u>

Finding: OPA's QA audit role in the organization is underutilized and can be more effective.

Discussion: OPA's has conducted quality control review and method development reviews of the Northern and Southern Laboratory Program. Results of these reviews are not formalized but verbally reported at the Division Chief level. A corrective action plan is not required even if observations are made. It was noted, however, that as a result of these reviews, classical QA procedures (undefined) are now being implemented, whereas they were not prior to review.

Recommendation: OPA should be provided authority to conduct internal reviews of ARB-MLDs data collection and production operations, and that this authority be expanded to include self assessments of QMB and its effectiveness e.g., data production (field and lab), data handling and management activities within QMB, performance Audits conducted by ARB, and Standards Laboratory calibration activities – critical for ensuring data quality of ARB-MLD sites and Districts. Understanding and comprehensively evaluating how these functions are performed and interaction within the organization is necessary for determining the effectiveness of the existing QA system.

Finding RS23 <u>(OPA)</u>

Finding: Special Purpose Monitoring (SPM) projects are not implemented under a Quality Assurance Project Plan (QAPP), but a protocol developed specifically for the SPM.

Discussion: ARB is credited for developing data collection protocols specifically tailored to the SPM. The contents of the protocol reviewed "Freeway-Based Diesel Particulate Matter Signature Study" is relatively consistent with what is contained in a QAPP. However, it is not clear from the topics covered how QAPP objectives for sample collection and handling are met.

EPA requires organizations collecting and producing environmental data to establish QAPPs that include sample collection and handling procedures. The purpose of the QAPP is to ensure the data produced is of known and documented quality that can be used for its intended purpose (purpose for which it was collected).

Recommendation: It is recommended that the SPM protocols be developed consistent with elements contained in a QAPP, to include sample collection and handling. It is also suggested that a crosswalk be developed linking the SPM protocol to the QAPP element it corresponds, to ensure all elements are captured.

Finding MP8 (General/QA Branch / EPA OAQPS)

Finding: There is a problem with obtaining access to AQS accounts of Districts that are part of the ARB PQO but their own AQS Reporting Organizations (RO).

Discussion: Each RO must be consulted to obtain permission to input AQS data for the sites operated by the RO. There have been complications for the MLD QA Section and others involved in central PQO activities gaining access to input data into AQS for dependent ROs. This is not acceptable, for a PQO to function the central QA and Data managers need AQS access.

Recommendation: Over the short term ARB should work with the RO's in the ARB PQO to facilitate obtaining access. Over the long term the Region should ask OAQPS to develop procedures for PQO's with multiple RO that are consistent with data quality.

Finding MP9 (QA Section)

Finding: The QA Section has experienced a high staff turnover in recent years, which has impacted the level of institutional knowledge in the section and impacted their ability to perform audits.

Discussion: The QA Section has responsibility for performance and site audits across the ARB PQO. This is one of the few threads of consistency that the PQO has and, as such, is a critical operation. Additionally, instrument and site problems encountered during the audits sometimes require a detailed knowledge of air monitoring operation across a diverse range of equipment. This knowledge is needed to: correct problems encountered conducting audits; judging the site operator's abilities to correct deficiencies needed for re-testing sites; evaluating siting and instrument configuration issues; demonstrate to District personnel that audit failures are due to site problems rather than improper auditing. Additionally, some audits have been canceled due to insufficient trained staff.

Recommendation: ARB MLD needs to develop a plan to reduce turnover in QA audit staff and/or attract more senior staff to the QA Section.

Finding MP10 (QA Section)

Finding: Training, while in place in the ARB MLD does not necessarily extend to all staff and the ARB PQO Districts.

Discussion: The QA Section in the QA Branch and the Air Quality Surveillance Branch (through the Operations Support Section) have implemented training programs, which are in place but still being refined. EPA applauds ARB MLD on these and encourages ARB MLD to continue these and other training programs in place. However, there should be a central evaluation of training through the entire PQO to ensure that all monitoring staff receive adequate and consistent training.

Finding MP11 (QA Section)

Finding: The ARB data system and AQS may contain inconsistent data for criteria pollutant data within the ARB PQO.

Discussion: The ARB PQO should be using consistent data for making decisions. However, it was indicated that at times MLD has invalidated data on the ARB database when dependent RO's have refused to invalidate data on AQS. This should not occur within a PQO.

Finding MP12 (QA Section)

Finding: The QA Section does not assure that sites that fail performance audits are re-tested after a corrective action is implemented.

Discussion: The QA Section will make an effort to re-test sites based on their field schedule. In practice sites that are far from the Sacramento office do not get retested because it is prohibitively labor and resource intensive. The QA Section should establish criteria when retesting is needed based on the necessity of data and/or develop an alternative to sending the Trailer based system to retest sites.

Finding MP13 (QA Section)

Finding: ARB MLD does not perform routine audits of data quality.

Discussion: EPA QA/R-5, EPA Requirement for Quality Assurance Project Plans, discusses assessments that should be elements of a quality management program these include, "surveillance, management systems reviews, readiness reviews, technical systems audits, performance evaluations, audits of data quality, and data quality assessments." Audits of data quality include periodic checks of a small portion of the data produced to ensure that the data set was collected as specified by regulation and in the QA planning documents, included all the appropriate supporting documentation, all supporting data calculations were correct, and the validation was properly performed.

Finding SR1:

Finding: For SOP MLD 022, a second source quality control standard is not being analyzed as required by the method.

Discussion: While the Organic Laboratory does perform an **a**nalysis of a second standard, the standard is not prepared from a second standard source but from a dilution of the same standard solution that is used to prepare the working calibration standards. Analysis of a second source quality control standard referenced to the initial calibration is an effective quality assurance control check on the integrity of the primary standard solution and is required by the method.

Recommendation: It is recommended that the analysis of the control standard be prepared from a second standard source.

Findings SR2, SR6, and SR13

Finding: Analyses of audit samples are not being performed as part of SOPs MLD 022 (Aldeydes and MEK by HPLC), MLD 039 (Hexavalent Chromium by IC), or MLD 066 (Oxygenated Hydrocarbons and Nitriles

Discussion: Audit samples prepared from a different standard source than instrument calibration standards are an important independent quality assurance technique used to assess the accuracy of the data generation process. Audit samples can help to surface out of control situations with the instrument or standards or other problems that may not be apparent from routine instrumental generated quality control (QC) results such as calibrations or data inspection. Documentation of acceptable results for routine audit samples would serve an important role in increasing the level of confidence in data. EPA believes that audit samples would be a great benefit to ensure accuracy especially in assessing the accuracy of ARB methods where external methods of standardization are used. EPA believes that internal standard methods are far more accurate.

Recommendation: It is recommended that a program of routine submission of audit samples be implemented. Ideally the audit samples should be submitted to analysts double blind i.e. without their knowledge they are analyzing quality assurance audit samples to eliminate possible bias. Results for audit samples are best when control charted. The EPA Region 9 office may be able to assist ARB in securing funding for an audit program.

FINDING SR3

Finding: Field blanks are not being analyzed for SOP MLD 022. Sample results are being corrected for background contamination based on an average background contamination of 0.3 ug/cartridge determined from a field blank study performed by MLD 15 years ago. The EPA auditors were told that field blanks have not been deployed for 15 years.

Discussion: Routine submission of field blanks is necessary to evaluate possible contribution of contamination from sources extraneous to samples. The importance of current field blank studies is heightened in light of changes observed in field sampling technology since the background study was performed. It is questionable that the background level of contamination has remained constant.

Recommendation: ARB should develop a routine system of employing field blanks.

FINDING SR4

Finding: The laboratory is not using an internal standard method of analysis as described by the method. The laboratory is currently using the external standard method of standardization.

Discussion: Internal standards are useful in compensating for changes in the electrical system during sample analysis and detection and perhaps more importantly compensate for changes in autosampling volume which can vary with air bubbles that impacts quantitation. Internal standard methods are more accurate than external standard methods.

Recommendation: It is recommended that the laboratory change to the internal standard method or evaluate the accuracy of its data generation process through audit samples with rigorous control ranges and consider changing to the internal standard methods based on the results.

FINDINGS SR5, SR7, SR9, SR16, SR21

Finding: For methods SOPs MLD 022, MLD 039, MLD 066, MLD 058, EPA found no evidence that secondary review of instrument logbooks was being performed by the lab supervisor.

Discussion: Regular review of instrument logbooks by a supervisor or QA department helps to ensure that proper analysis protocol is being followed, e.g. calibrations, blanks analyses etc. Repeated failures or attempts to pass calibrations noted in logbooks can be an indication that instrument maintenance or other corrective actions need to be performed.

Recommendation: It is recommended that a system of periodic review and documentation of review of instrument runlog books be implemented and documented by initialing the instrument run logbook.

Finding SR8

Finding: It is noted that the laboratory is looking into the purchase of an additional IC for performing method MLD 039.

Discussion: The laboratory currently has one IC dedicated to hexavalent chromium analysis which it takes great care to keep in working order in light of the fast sample degradation of hexavalent chromium samples once they have been extracted. The purchase of a second system which can serve as a back up system in case of instrument failure will help prevent the possible loss of samples through degradation.

Recommendation: The future purchase of back up testing equipment that is in the planning stages is noted as a positive finding.

Canister Cleaning & Certification

Finding SR10

Finding: Laboratory staff performs a random pull of canisters for certification testing. The laboratory does not take into consideration which canisters had the highest concentrations of contaminants prior to cleaning when deciding which canister in each batch to test for cleanliness certification.

Discussion: Random pulls of canisters for certification could be expected to result over time in an eventual pull of all canisters including those most heavily contaminated prior to cleaning. However, some sources such as the "Technical Assistance Document for Sampling and Analysis of Ozone Precursors" recommend tracking the historical contamination level of canisters and pulling canisters that contained the most highly contaminated samples for certification. ARB staff person Steve Madden stated that he had recommended or was planning to recommend tracking canisters to ensure that all canisters at some point are certified through the random pull process which would serve a similar objective.

Recommended: ARB may want to consider other procedures, such as those developed by the laboratory staff, for choosing which canisters are certified. This would ensure all canisters eventually go through the certification process. Alternatively, laboratory staff could select the canisters with the highest prior sample concentrations for certification based on a tracking system.

Canister Cleaning & Certification

Finding SR11

Finding: Canisters are not vented in hoods and are vented to ambient air.

Discussion: It is good laboratory practice to release sample air including ambient air in a hood to avoid the potential for contributing to air contamination.

Recommendation: It is recommended that unused sample in canisters be released in a hood.

Canister Cleaning & Certification

Finding SR12

Finding: The laboratory has not established a retention time for canisters after they have been certified. The laboratory relies on the canister pressure gauge reading as an indication the canisters have not lost vacuum.

Discussion: Pressure gauge monitoring after cleaned and certified canisters are shipped to the field is a good quality assurance measure for ensuring significant vacuum loss has not occurred. Establishing a retention time policy for canisters stored at the laboratory after they have been cleaned and certified would provide additional assurance that canisters have not become contaminated over time through smaller leaks.

Recommendation: It is recommended that the laboratory establish a retention time policy for canisters after they have been cleaned after which they will be re-cleaned and certified as an added quality assurance measure they have not become contaminated. A retention time of 30 days would be reasonable. Alternatively, it is recommended that language be included in the Quality Assurance Plan that all canisters are used and recycled within 30 days if such is the workload.

Finding SR14

Finding: The Organic Laboratory recently purchased a GC/MS Saturn D for performing SOP MLD 066. This new instrument, which was brought on-line in April, 2007, is being used to generate data but a Minimum Detection Limit (MDL) study has not been performed and documented.

Discussion: Documentation of instrument specific MDL studies is fundamental whenever data with non detects is being reported.

Recommendation: Data should not be reported on instrument Saturn D until an MDL study has been performed and documented.

Finding SR15

Finding: Although the SOP MLD 066 is based on the TO-15 method which describes an internal standard method of calibration, the ARB Organic Laboratory is instead using an external method of standardization.

Discussion: Internal standards are useful in compensating for changes in the testing equipment electrical system during sample analysis and detection. Perhaps more importantly, using internal standards can compensate for changes in autosampling volume which can have significant impacts on quantification. Internal standard methods are generally more accurate than external standard methods.

Recommendation: It is recommended that the laboratory assess the accuracy of data generation with this method through the use of audit samples with rigorously derived quality control limits. A decision to develop an internal standard method can be based on the results. It is the understanding of the audit team from discussion with management during the onsite visit that development of an internal standard method was initially attempted during method development by ARB but abandoned due to the difficulty in identifying suitable internal standards. The EPA Region is interested in offering possible

assistance with the procurement of audit samples and identification of suitable internal standards.

Finding SR17

Finding: For SOP MLD method 066, mass calibration is being achieved with perfluorotributylamine (FC -43) but confirmation that tuning abundance criteria have been met is not being verified through the analysis of 1-bromo-4fluorobenzene (BFB). It is the understanding of the audit team that tentatively identified compounds are not routinely being reported with this method.

Discussion: BFB instrument tuning checks serve to ensure correct mass peak assignment (rule out possible mass shifts) and ion abundance ratios. Verifying that tuning and performance criteria are met prior to sample analysis with BFB ensures that data produced by the instrument may be correctly interpreted and allows non target list compounds to be tentatively identified through library search routines. In our experience, the BFB tune also serves a secondary purpose of monitoring instrument sensitivity because failure of the tuning check is often the first indicator of sensitivity loss.

Recommendation: The FC-43 method of tuning should be acceptable as long as tentatively identified compounds (TICs) are not reported. It is recommended the SOP be revised to reflect that a BFB tune will be performed for special events where TICs are reported.

Finding SR18, SR20

Finding: The GC/MS instruments are not vented to outside the facility.

Discussion: It is good laboratory practice to vent GC/MS instrumentation to outside the facility as a health precaution to employees.

Recommendation: It is recommended that instrumentation be vented to outside the facility or to traps to lessen the possible inhalation of contaminated air by employees.

Finding SR19

Finding: For SOP MLD 058, duplicate samples are being analyzed and presented as tabulated results in quarterly QA reports but control charting is only occasionally performed.

Discussion: Control charting of duplicate sample results imparts added value when evaluating trends. The EPA auditors discussed this issue with the laboratory managers, who agreed this is a valuable practice.

Recommendation: The laboratory may want to plot duplicate results for added value in viewing the results and looking for trends.